SCHOOL OF CIVIL ENGINEERING

INDIANA DEPARTMENT OF HIGHWAYS

JOINT HIGHWAY RESEARCH PROJECT
JHRP-83-7

ENGINEERING SOILS MAP OF DUBOIS COUNTY, INDIANA

Chen-Tair Huang

PURDUE UNIVERSITY

Final Report

ENGINEERING SOILS MAP OF DUBOIS COUNTY, INDIANA

TO: H. L. Michael, Director
Joint Highway Research Project

July 6, 1983

Project: C-36-51B

FROM: R. D. Miles

File: 1-5-2-70

Attached is the Final Report on the "Engineering Soils Map of Dubois County, Indiana." The map and report have been prepared by Mr. Chen-Tair Huang, Graduate Assistant on our staff under the direction of Professor Robert D. Miles.

This is the 69th county map which has been completed by using aerial photography and available information. The map and report should be very useful in planning and developing engineering facilities in Dubois County.

The Report is presented to the Board as a final report showing completion of the Dubois County engineering soils mapping project.

Sincerely,

Robert D. Miles

Robert D. Miles

RDM:rw

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Final Report

ENGINEERING SOILS MAP OF DUBOIS COUNTY, INDIANA

by

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Graduate Assistant

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Project No.: C-36-51B

File No.: 1-5-2-70

Prepared as Part of an Investigation

Conducted by

Joint Highway Research Project
Engineering Experiment Station
Purdue University

In Cooperation with

Indiana Department of Highways

Purdue University
West Lafayette, Indiana
July 6, 1983

ACKNOWLEDGMENTS

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All airphotos used in connection with the preparation of this report were obtained by the Indiana Department of Highways and the United States Department of Agriculture.

Engineering Soils Map of Dubois County, Indiana

Introduction

The engineering soils map of Dubois County, Indiana which accompanies this report was done primarily by airphoto interpretation. The aerial photographs, having an approximate scale of 1:20,000, were taken in December 1937 for the United States Department of Agriculture and were purchased from the agency.

Aerial photographic interpertation of the land forms and engineering soils of this county was accomplished in accordance with accepted principles of observation of inference (1). A field trip was made to the area for the purposes of resolving ambiguous details and correlating aerial photographic patterns with soil texture. The final land form and parent material boundaries were graphically reduced to produce the engineering map (1 inch = 1 mile). Standard symbols developed by the staff of the Airphoto Interpretation Laboratory, School of Civil Engineering, Purdue University, were employed to delineate land forms, parent materials and soil textures. Parent material symbols were grouped according to land form and origin, and texture symbols were superimposed to indicate the relative compositions of the parent materials. The text of this report largely represents an effort to overcome the limitation imposed by adherence to a standard symbolism and map presentation.

The map also includes a set of soil profiles which indicate the general soil profiles in the various land form parent

material areas. The soil profiles were complied from the agricultured literature and from the boring data of roadway soil survey along I64, SR 231, SR 162 and SR 164, (Appendix B). These data were supplied by the Indiana Department of Highways. Liberal reference was made to the "Formation Distribution and Engineering Characteristic of Soils." (2)

Description of the Area

General

Dubois County is in the southwestern part of Indiana (Figure 1). It has a total area of 277,120 acres (433 square miles). The county extends about 21 miles (35 km) from north to south and about 21 miles (35 km) from west to east. It is the second county north of the Kentucky-Indiana State line, and the third county east of the Illinois-Indiana State line. Jasper, the county seat, is near the center of the county. The population of the county is 34,238 according to the 1980 census data with a total rural population of 16,357. The population of Jasper is 9,097, Huntington 5,376 and Ferdinand 2,192, and the urban population increased 12.2 percent in the 1970-1980 period.

Drainage Features

Drainage features of Dubois County are shown in Figure 2, "Drainage Map-Dubois County," Indiana, prepared by the Joint Highway Research Project, Purdue University, 1953 (3).

Dubois County lies within three drainage basins of the state (4). The northern part of the county is in the East Fork subdi-

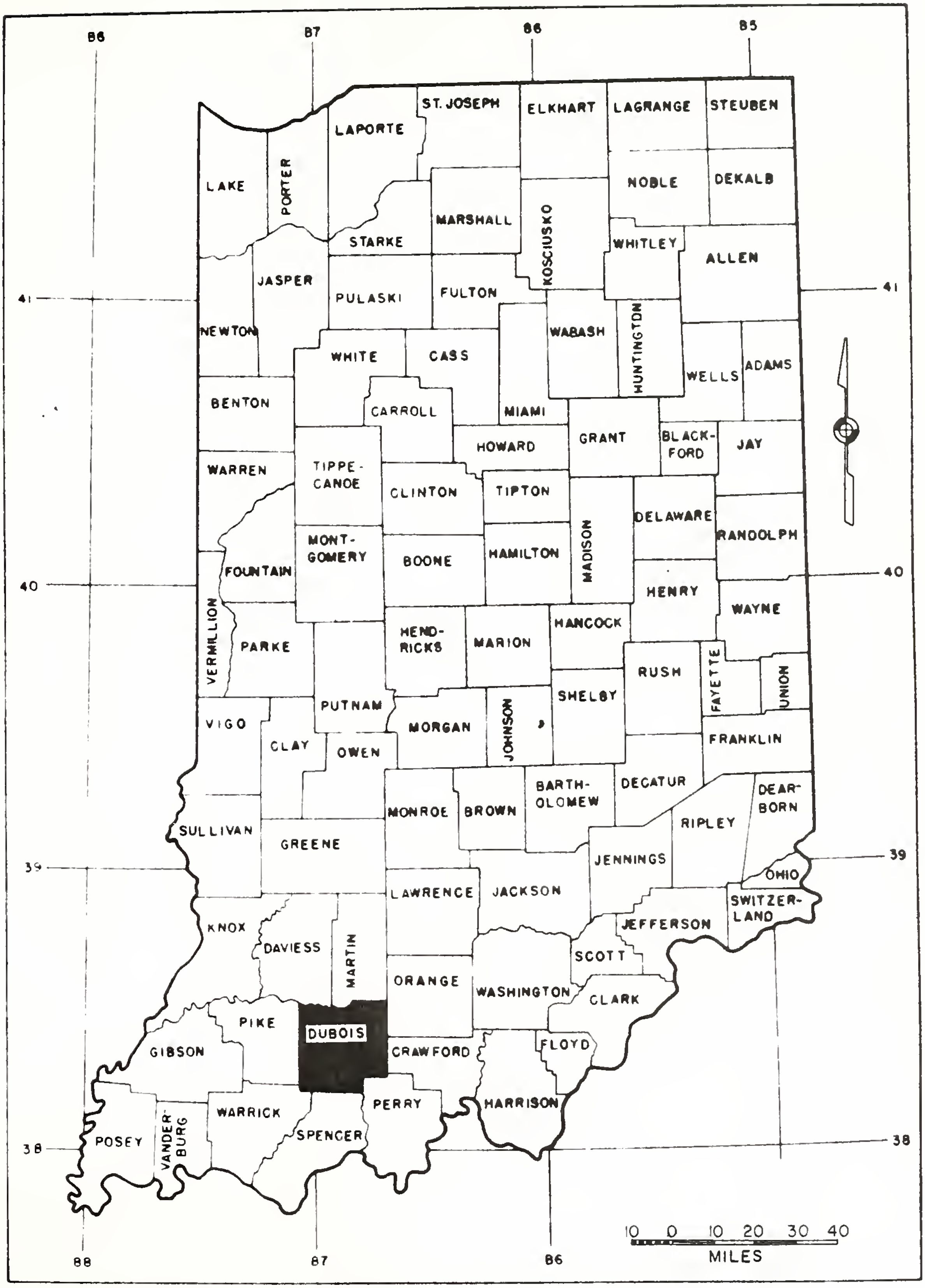


FIGURE I LOCATION MAP OF DUBOIS COUNTY

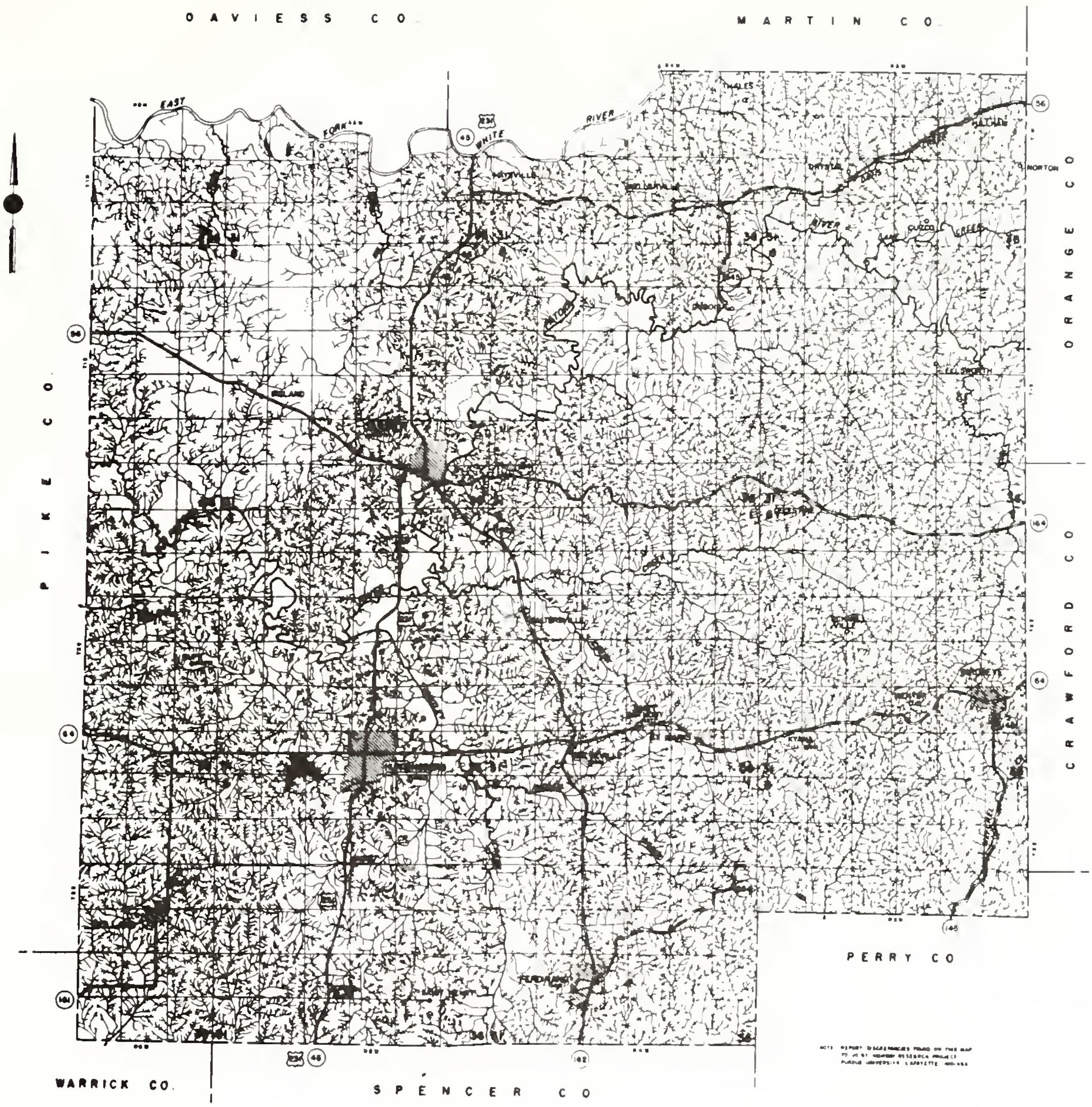


FIGURE 2

DRAINAGE MAP
DUBOIS COUNTY
INDIANA

PREPARED FROM
1937 AAA AERIAL PHOTOGRAPHS
BY
JOINT HIGHWAY RESEARCH PROJECT
AT
PURDUE UNIVERSITY

1953

SCALE OF MILES

vision of the White River basin. The remaining of the county is in the Patoka River drainage basin.

Surface drainage is well developed in the uplands of most of the county. Interstream areas in the northwestern part are relatively flat subsurface preglacial valleys exist in the northwestern part (5). The course of Patoka River seems to have been affected by glaciation. The Patoka River is a sluggish stream flowing through an aggraded valley. Its course has distinct angular bends in the western part of the county, indicating some rock control in that section. The White River valley acted as a glacial sluiceway. Drainage patterns are relatively fine textured in all upland areas except in the vicinity of Ireland. Short, Hurley, and Lick Fork Creeks appear to be influenced by the strike of the bedrock because of their rather definite northerly courses. Most streams in the northern part draining into the East Fork White River are small. Mill Creek and Birch Creek flow in a northerly direction to White River. Watershed divides exist in the northwestern, southeastern, and southwestern parts. The course of Flat Creek appears to have been affected by glaciation because of its deflections, it flows southeasterly in the county and joins Patoka River. Bottom lands of East Fork White River are identified by long curving intermittent drainageways. Streams crossing the Crawford upland are rectangular; they show the effect of rock control.

There are no glacial lakes in the county. Ponds of various origins are scattered throughout the area. Artificial lakes have

been constructed. Ditches have been constructed to improve drainage conditions, especially in the low-lying areas and nearly flat areas. A stream gaging station is located on Patoka River at Jasper (6).

Climate

Dubois County has a continental climate characterized by moderate winters and hot, dry summers. Summers are hot in valleys and slightly cooler in the hills. Some winters have short periods of subzero weather. Rains are fairly heavy and well distributed throughout the year. Snow falls nearly every winter, but the snow cover usually lasts only a few days. Table 1 gives data on temperature and precipitation for the survey area, as recorded at Paoli, Indiana, for the period 1951 to 1974. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring.

In winter the average temperature is 32 degrees F. and the average daily minimum temperature is 21 degrees. The lowest temperature on record, -27 degrees occurred at Paoli on January 28, 1963. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 86 degrees. The highest recorded temperature which occurred on July 15, 1954, is 107 degrees.

Of the total annual precipitation, 24 inches, (61 cm) or 55 percent, usually falls in April through September. In two years out of ten, the rainfall in April through September is less than

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1971 to 1974 at Paoli, Indiana]

Month	Temperature					Percipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have--		Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				Maximum temperature higher than--	Minimum temperature lower than--		Less than--	More than--		
	°F	°F	°F	°F	°F	In	In	In		In
January----------	40.3	19.0	29.7	69	-14	3.55	2.00	4.80	7	5.3
February---------	44.1	21.2	32.7	71	-10	3.23	1.52	4.61	7	4.0
March------------	52.6	29.2	40.9	81	7	4.64	2.50	6.38	9	3.8
April------------	66.4	41.0	53.8	86	20	4.38	2.65	5.93	9	.2
May--------------	75.7	49.6	62.7	92	28	4.47	2.70	6.04	8	.0
June-------------	83.6	58.7	71.2	97	40	4.34	2.39	5.92	8	.0
July-------------	87.0	62.3	74.7	98	45	4.45	2.77	5.95	7	.0
August-----------	86.5	59.7	73.2	98	43	3.25	1.72	4.49	5	.0
September--------	80.6	53.0	67.0	95	33	2.87	1.45	4.02	5	.0
October----------	69.9	40.2	55.0	88	20	2.55	1.06	3.74	5	.0
November---------	54.7	30.7	42.8	80	8	3.65	2.11	4.91	7	1.5
December---------	43.7	23.1	33.4	70	-6	3.50	1.84	4.85	7	2.6
Year---------	65.4	40.6	53.1	101	-16	44.88	38.98	49.66	84	17.4

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951 to 1974 at Paoli, Indiana]

Probability	Temperature		
	24° F or lower	24° F or lower	24° F or lower
Last freezing temperature in Spring:			
1 year in 10 later than--	April 17	May 7	May 17
2 years in 10 later than--	April 13	April 30	May 11
5 years in 10 later than--	April 6	April 18	April 30
First freezing temperature in fall:			
1 year in 10 earlier than--	October 17	October 4	September 26
2 years in 10 earlier than--	October 21	October 8	September 30
5 years in 10 earlier than--	October 29	October 17	October 7

21 inches (53 cm). The heaviest one-day rainfall during the period of record was 5.73 inches (14.55 cm) at Paoli on July 21, 1973. Thunderstorms occur on about 45 days each year, and most are in summer.

Average seasonal snowfall is 17 inches (43 cm). The greatest depth of snow at any one time during the period of record was 12 inches (30 cm). On the average three days have at least one inch (2.54 cm) of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The percentage of possible sunshine is 75 in summer and 45 in winter. The prevailing wind is from the south-southwest. Average wind speed is highest, 10 miles (17 km) per hour, in March.

Climatic data for this section were specially prepared for the Soil Conservation Service by the National Climatic Center, Asheville, North Carolina (7).

Physiography

Dubois County covers parts of two physiographic divisions which dominate southwestern Indiana-the Crawford Upland and the Wabash Lowland (Figure 3). The Crawford Upland covers the eastern part of the county. In respect to its physiographic situation in the United State most of the county is in the Interior Low Plateau Province; only a small area in the northwest

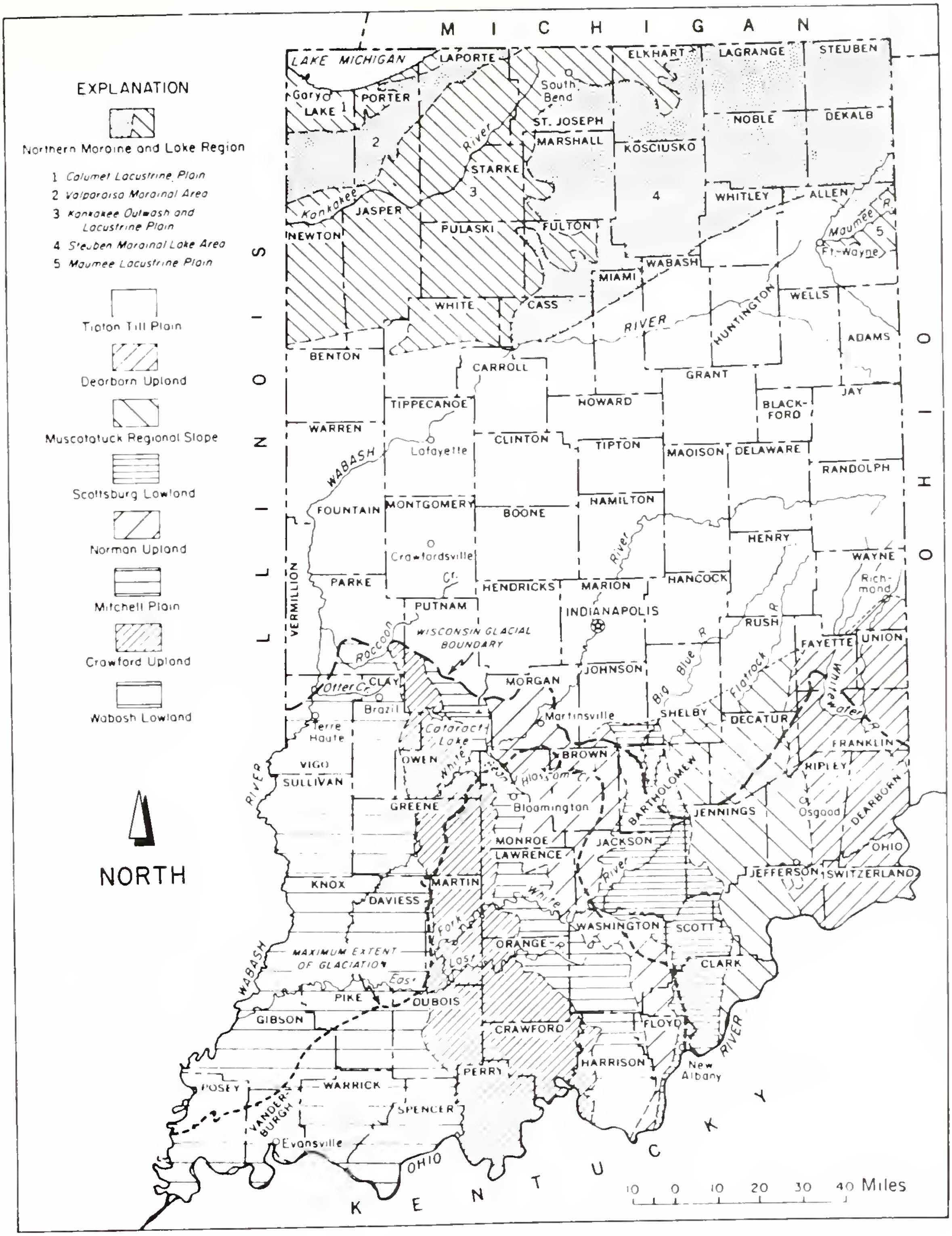


Figure 3 Map of Indiana showing physiographic units and glacial boundaries. Modified from Indiana Geol. Survey Rept. Prog. 7, fig. 1.

corner is in the Till Plain section of the Central Lowland Province.

The Crawford Upland is the remnant of a peneplain where stream dissection had reached a mature or postmature stage, and little or none of the original peneplain remains. The Wabash Lowland is characterized by shallow aggraded valleys with unusually wide bottoms. The valley of Patoka River, the only stream crossing the county, is an example of this difference between the Crawford Upland and the Wabash Lowland. Where the river traverses the Crawford Upland, the valley is approximately 250 feet (76 m) deep and less than one-half mile wide; but where the river enters the Wabash Lowland, the valley is only about 50 feet (15 m) deep, and within a short distance the strip of alluvium is a mile wide.

Topography

The topographic expression of the county is that of a stream-dissected upland (Figure 4). For the most part, it is rolling. Knolls of prominence occur in the northeastern part. Maximum local relief is about 260 feet (79 m) (4). With the exception of the northwest corner, most of the county is in the unglaciated portion of the state and not subject to the smoothing affect of glaciation.

The Crawford Upland is characterized by considerable diversity of relief, and it includes high hills, low hills, steep slopes, moderate slopes, ridges that do not maintain an even

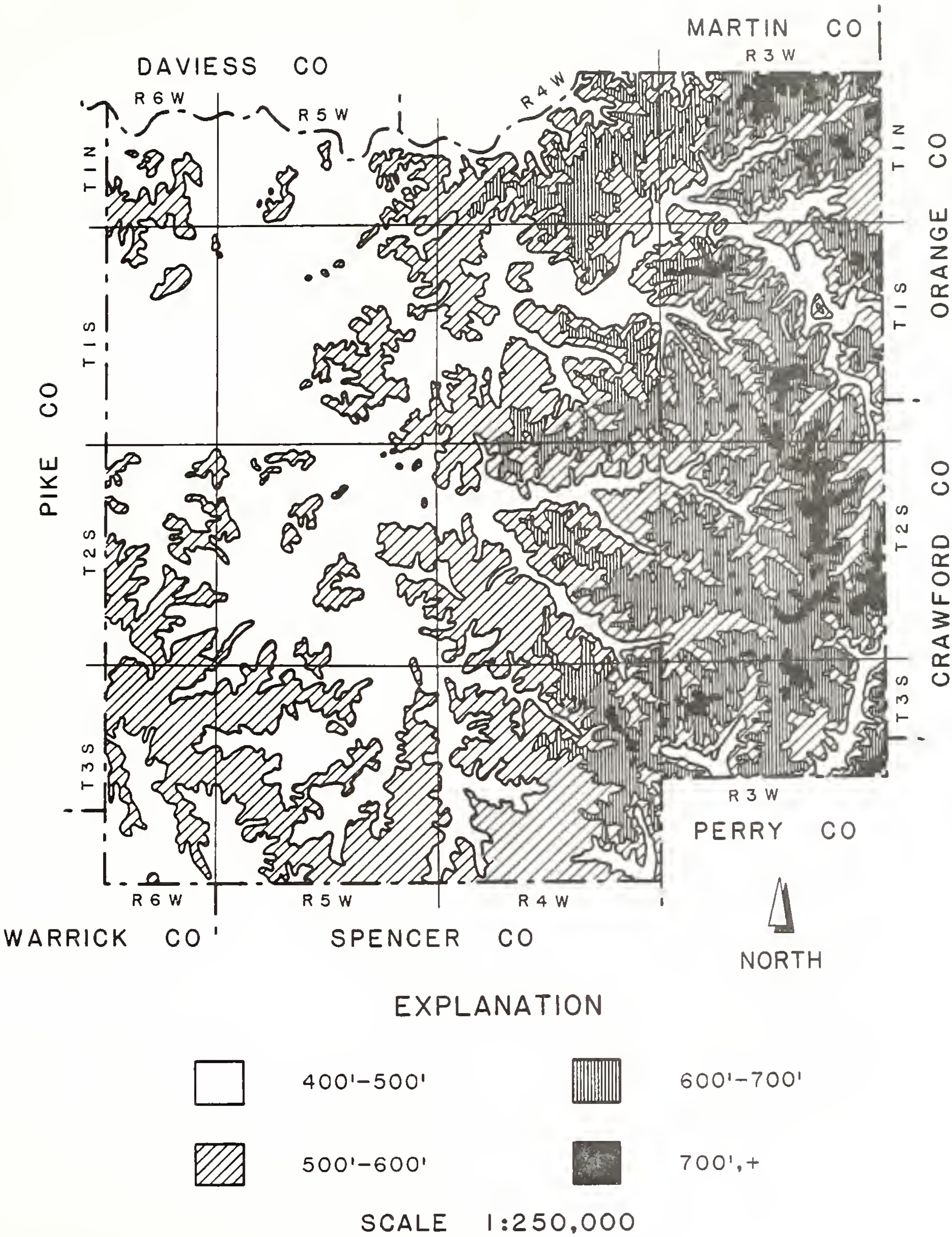


FIGURE 4 TOPOGRAPHY MAP OF DUBOIS COUNTY

altitude, and flat-bottomed valley floors and ridge tops. Stream dissection is extensive. This is especially true in the northern and southern parts, where local differences in elevation in many places exceed 200 feet (61 m). Throughout this division the ridges are narrow, sharp and have very steep slopes. In the vicinity of Schnellville, as the main streams lie at some distance, the base level of the local drainageways is at a higher altitude, the ridges are wider and more rounded, and the slopes are more moderate.

As the western limits of the Crawford Upland are approached, the average elevation of the ridges gradually decreases from 700 to about 500 feet (213 to 152 m) which is the level of the Wabash Lowland. The northern part of this lowland is approximately 30 feet (9 m) lower than the southern part. Blocking of streams by the Illinoian ice sheet resulted in the development of two types of relief in the Wabash Lowland. Prior to the intrusion of the glacier the drainage waters flowed northwestward, but when these were obstructed, a lake was formed in the northern part of the county, which became filled with silt and other sediments from the stream and the melting glacier, forming a plain. The plain is comparatively smooth, with steep banks to the rather shallow valleys. The rest of the Wabash Lowland within this county is more completely dissected, and the slopes are more gradual than on the flatter land to the north. The ridges are broader and more rounded, in many places sloping gently to the stream valleys which are about 50 feet (15 m) deep. The central and

southwestern parts of the county are completely dissected but, because the grade level of the stream is lower and erosion has been in progress a long time, the slopes are less steep than those in the eastern part (8).

Geology

Surface and near surface geologic ages represented in the county are the Quarternary period and the bedrock formations (9). Quaternary materials are both Pleistocene and recent in age. Figure 5 shows a generalized bedrock geology map of Dubois County (10). The bedrock formations of Dubois County consists of strata of Mississipian and Pennsylvanian age. Some of the Chester formations of Mississippian age outcrop on the eastern edge of the county but they occupy only a narrow belt. A few inliers of Chester rocks occur within the area of the Pennsylvanian outcrop farther westward, are exposed in areas of low hill topography. The Pottsville Series of the Pennsylvanian underlie most of Dubois County. The overlying Allegheny Series are found in a belt about four miles (6.8 km) in width along the western margin of the county. The Allegheny Series occupy about 80 square miles. The Pennsylvanian strata consists of coals, shales, sandstones, and clays. Table 3 shows the generalized geologic section for Dubois County.

Figure 6 gives a columnar section showing bedrock units for the county (10). The surface expression of the bedrock units is younger strata in the western part and older strata exposed in the eastern part of the county.

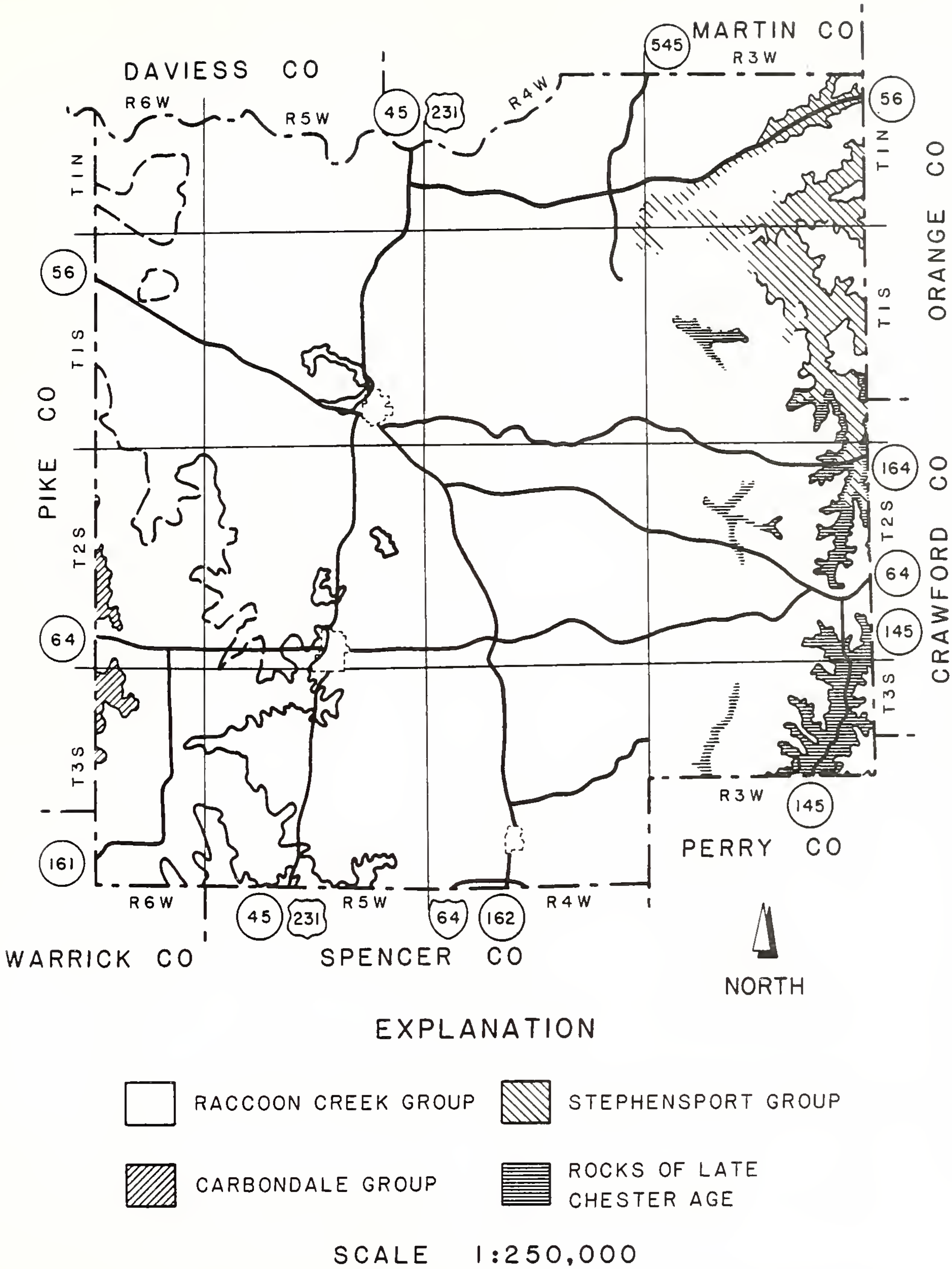
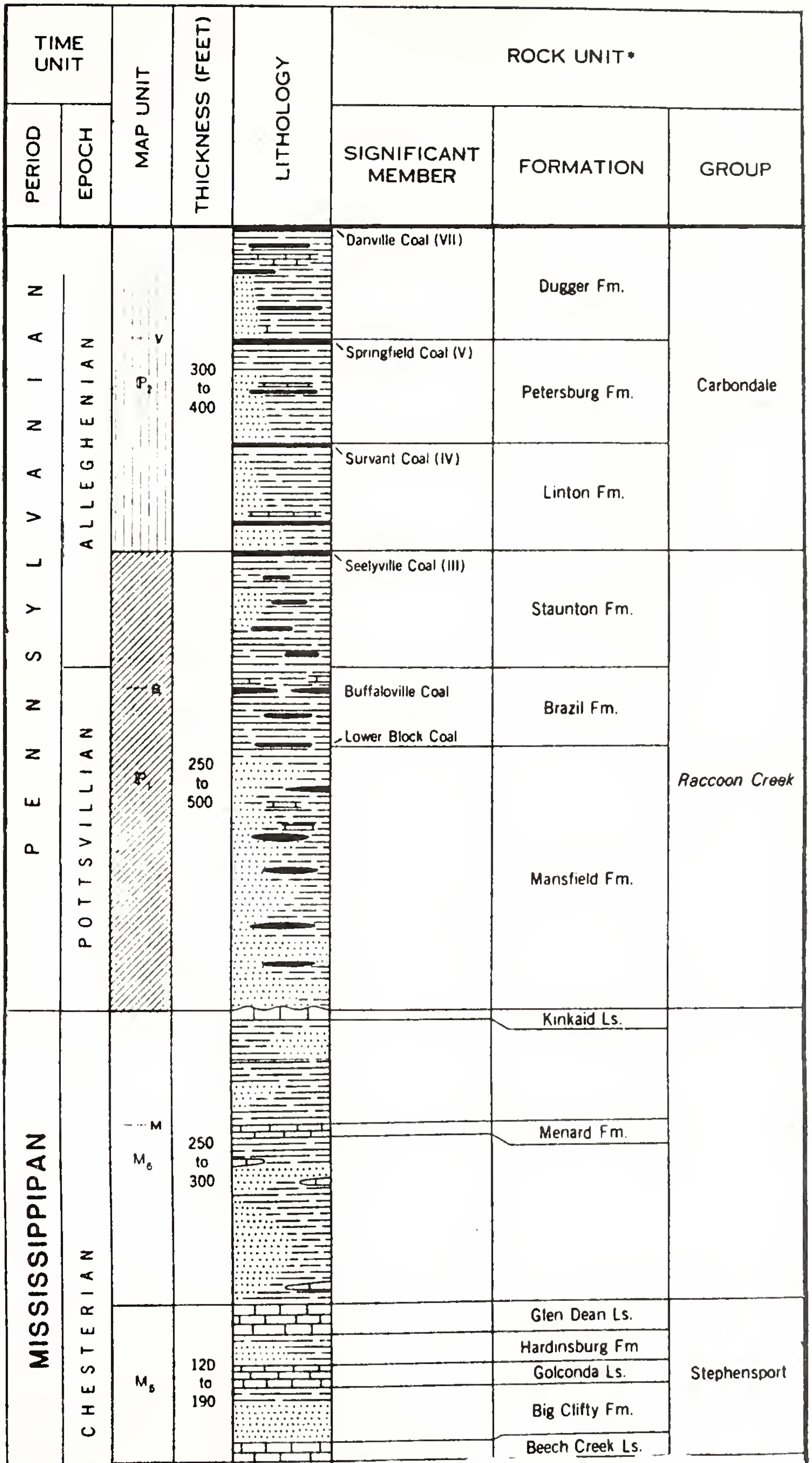


FIGURE 5 BEDROCK GEOLOGY MAP OF DUBOIS COUNTY



(After Gray, Henry H., etal. 1970)

FIG. 6 COLUMNAR SECTION SHOWING BEDROCK UNITS DUBOIS COUNTY

Table 3. Generalized Geologic Section for Dubois County

Quaternary:	
Recent, (chiefly alluvium)	0--50 ft.
Pleistocene (glacial drift, lacustrine deposits)	0--50 ft.
Pennsylvanian	475 ft.
Allegheny (shales, coals, sandstones, limestones, clays)	75 ft.
Pottsville (shales, coals, sandstones, clays)	400 ft.
Mississippian	
Chester	400 ft.
Valmeyer (not exposed)	

Land Form and Engineering Soil Areas

The engineering soils in Dubois County are derived both from the unconsolidated material and from the weathering of sandstone, limestone and shale bedrock (Figure 5). The unconsolidated materials include both fluvial deposits, lacustrine deposits, and eolian deposits (Figure 7).

With the exception of the very northwestern corner, Dubois County is located within the driftless area of southern Indiana. An area in the northwestern part of the county was at one time a glacial lake bed; thus, a fairly level topography exists today. A few hills of preglacial origin rise above the general level, though most of the area is mantled with alluvial and glacial-fluvial deposits. In general, the topography of Dubois County is very dissected, especially in the eastern portion, where the

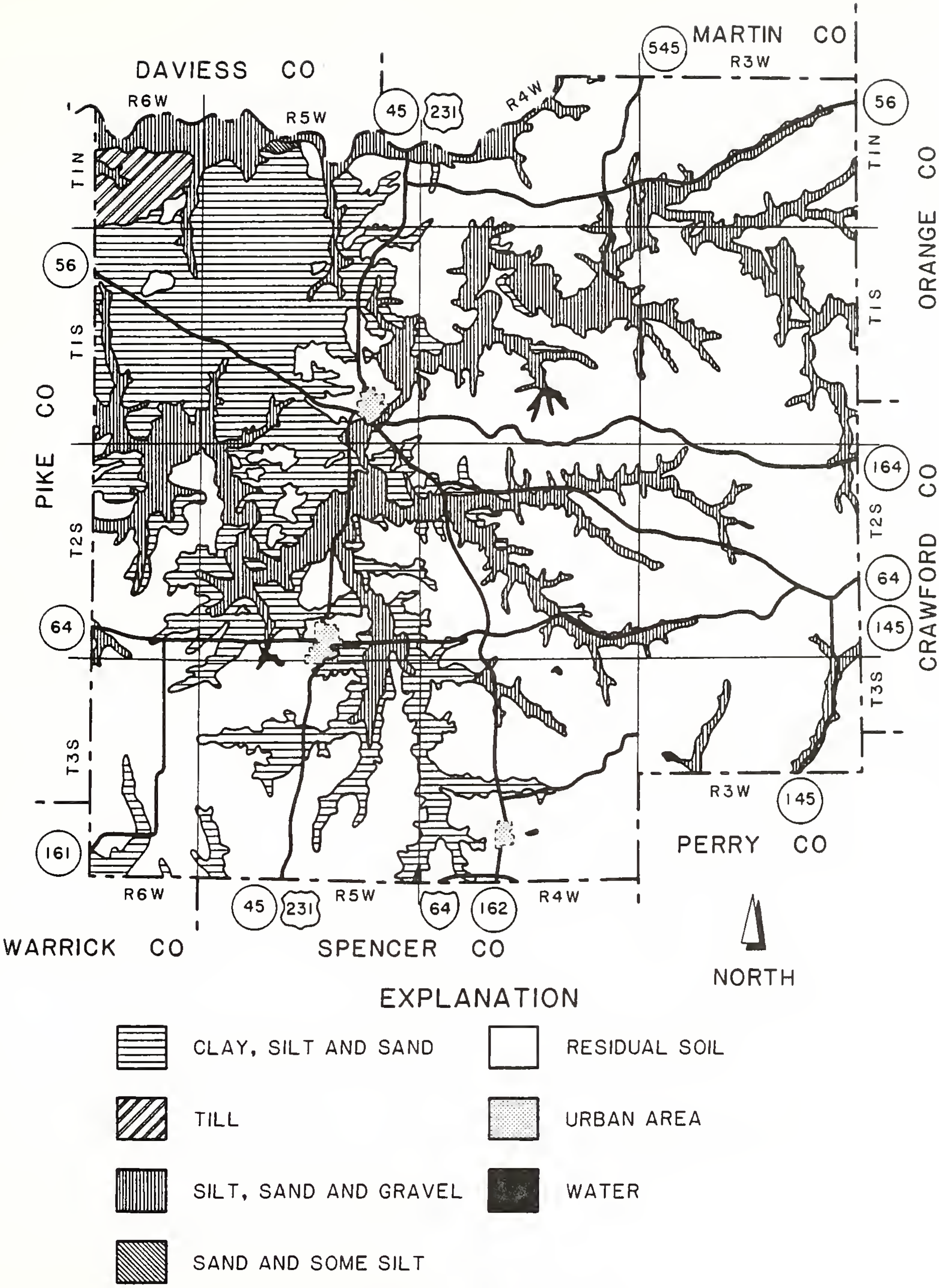


FIGURE 7 UNCONSOLIDATED SOIL MAP OF DUBOIS COUNTY

hills forming the low plateaus rise 75 to 200 feet (23 to 61 m) above the valleys. This same condition prevails in the southwestern part of the county, though the hills of the plateaus have more gentle slopes related to bedrock weathering.

Plateaus of highhills, narrow winding ridges and steep bluffs with rock exposures in the eastern and southern portions of the county, and with level plains and low rolling plateaus in the western part of the county characterize the landforms of the county.

Fluvial Deposited Materials

The fluvial drift in Pike county include: alluvial plain, terrace, valley train and lacustrine plain.

1. Alluvial Plain

The great bulk of the fluvial drifts of the alluvial plain are sandy silts, silts and clay that are deposited upon the flood plains of the many stream valleys within the county. The two largest alluvial plain areas (bounded by sawteeth on the map) are along the East Fork White River and Patoka River. The tributaries to these streams, such as Huntley Creek, Indian Creek, Flat Creek, Hall Creek and Care Creek, also are bordered by narrow alluvial plains. Annual flooding is anticipated within the areas.

Parent material, at a depth of 10 in. to 60 in. (25-152 cm), is usually stratified silty loam, loam, fine sandy loam (A-4 soils) or silty clay loam (A-6 soils). This thickness of the

surface layer varies from 6 in. to 10 in. (15-25 cm) and is silt loam (A-4 soils or A-6 soils). The subsoil, at a depth of 7 in. to 51 in. (18-130 cm) is loam or silty loam (A-4 soils or A-6 soils).

Boring site No. 24 is located in this region. It is taken in the Lick Fork Creek area at an altitude of 515.6 ft (157.2 m) above sea level. A 3.5 ft (1.1 m) silty clay loam (A-4 (4)) soil lies under a 0.5 ft (15 cm) layer of top soil. Then a 5.5 ft (1.7 m) silty clay (A-6 (13)) soil which contains 10% sand. 57% silt and 33% clay, is followed by a 7.5 ft (2.3 m) silty clay loam (A-4 (8)) soil, then by silty clay (A-6 (10)) and sandstone fragments. Flooding is the major problem in this area.

2. <u>Terrace and Valley Train</u>

Along the East Fork White River and Patoka River there are a few terraces and valley train deposits. Infiltration basins are a common feature of these coarse-textured terrace deposits. The terrace surface and the lower flood plain is subjected to flood erosion and deposition. Some surface drainage or erosion occurs in the high terrace and the surface is undulating. The lower terraces are more smooth and level in topography with little or no surface drainage channels on their surfaces.

The texture of the terrace varies greatly from place to place. The soil profile consists of a sandy loam to silty clay loam topsoil underlain by a silty clay loam to clay then a gravelly to a sandy clay subsoil. Stratified sands and gravel are encountered at depth.

3. Lacustrine Plains

The soils developed from lacustrine deposits occupy the flat plain in the northwestern part of Dubois County. The topography of the lacustrine plain is a nearly lever plain broken only by widely spaced drainage channels. One of the pecularities of this section is the occurrance of isolated hill remnants of the former uplands, which are underlain by bedrock at a comparatively shallow depth. These island hills as they are called, occur as rounded knolls rising about 30 feet (9.1 m) above the surrounding plain. Areas of such character occur in sec. 36, T1N, R6W and in sec. 11, T1S, R2W. (7). The soil is developed partly from the thin loess cover and partly from the sheet wash materials.

The thickness of the top soils varies from 11 in. to 15 in. (28-38 cm) and is silty loam, silty clay loam (A-4 or A-6 soils) or silty clay (A-7 soils). The subsoil at depth of about 11 in. to 39 in. (28-99 cm) is silty clay or silty clay loam (A-7 soils). Stratified silty clay loam and clay (A-6 or A-7 soils) is found as underlying soils.

Most engineering problems associated with the lacustrine deposits are the result of the behavior of contained water. The lacustrine material, in most places, is water saturated. Typically, the more premeable materials are scattered through the lake deposits as thin horizontal layers and lenses and they provide the only effective avenues for water movement. Because of

the poorly drained situation in some areas, frost heave, settlement and weak supporting power of the soils are the major problems in this deposit.

Eolian Drift

There are extensive eolian (wind) deposits in Dubois County, (Figure 8, Appendix A). Except for the alluvial plains, the entire county is covered by windblown silt or loess deposits of varying depth. The eolian deposits are subdivided into two groups, sand deposits and loess deposits.

1. Windblown Sand Deposits

Windblown sand deposits are very limited in Dubois County. They are scattered along the East Fork White River bluffs and occur as dunes.

The materials of the sand dune are predomiantly fine, uniform, windblown sand some including a considerable amount of silt and some clay particles mixed with the sand especially in the surface layer.

On the aerial photographs the surface of the sand area appears to have a very coarse texture when compared with that of loess. Surface drainage is generally absent in the sand dune deposit. As the water infiltrates the sand it tends to form slight infiltration areas producing a somewhat darker area on the airphoto pattern. These darker areas create a speckled appearance which contrasts with the more uniform gray tone or mohair appearance of the loess (11).

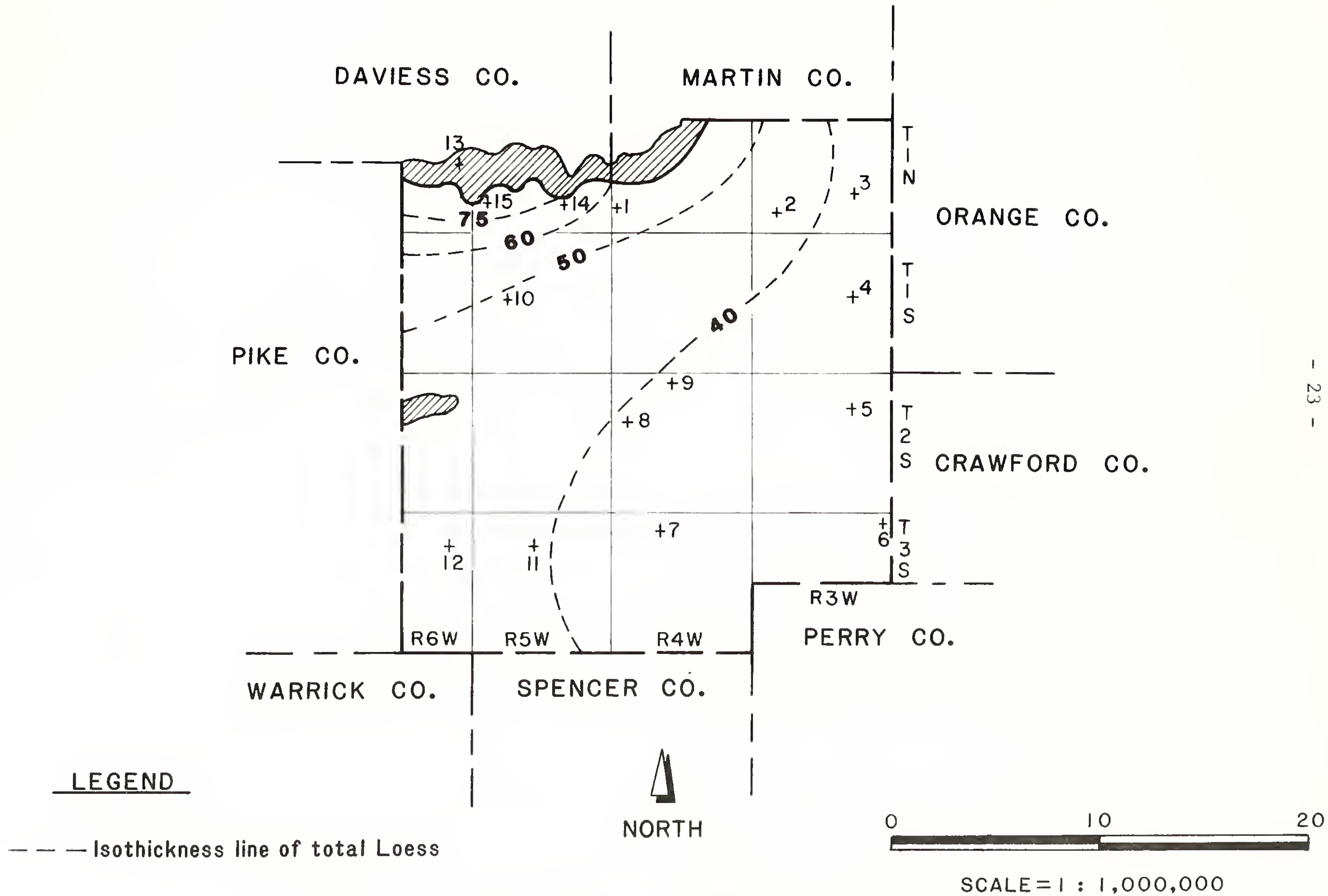


FIGURE 8 LOESS THICKNESS MAP OF DUBOIS COUNTY

The soil profile of sand dune deposits consist of a loamy fine sand (A-2 soils), fine sand (A-3 soils) or sandy loam (A-4 soils) topsoil, overlying a sandy clay loam to sandy loam (A-4 soils) subsoil.

Little or no problems other than stabilization and compaction are expected in this area. However, if deep cuts are required the characteristics of the underlying materials should be taken into account.

2. <u>Windblown Silt Deposits</u>

The silt deposits were blown by northwest winds from the river valley and lacustrine plains and were deposited during the Wisconsin glacial period and recent times. As a result of its method of deposition the loess tends to modify and smooth out the existing topography. Its stream-lining or wind swept appearance is an important feature in the identification of loess.

(a) Moderately Deep Loess Covered Till Plains

The northwestern corner of Dubois County is occupied mainly by the Alford soil. The parent material is leached loess more than five feet (1.5 m) thick. The soil profile of loessial deposits consists of silt loam (A-4) topsoil and silty clay loam (A-6) subsoil. The material below the loess is glacial till. The till is found on higher elevation between the White River bottoms and the Patoka Lake plain. The till is shallow and is underlain by bedrock.

The engineering problems in this area are primarily the control of moisture during construction and compaction of the silty material. The subgrade is weak under adverse moisture or due to frost action in winter. Pumping and erosion are potential problems in this region.

(b) Discontinuous Loess Over Weathered Bedrock

About three fifth of Dubois County is classified as discontinuous loess covered weathered bedrock area. The surface slope varies from 2% to 60%. Many gullies are developed in this region and the topography is extremely rugged and blocky.

The soil profile varies greatly depending on its topographic position, erosional situation, and rock types. Soils in the gently sloping areas are developed partly from thin loess and bedrock whereas in the steep slope areas or gully lands the loess and even the residual soil is removed and bedrock is exposed.

The topsoil is very stony silt loam (A-2, A-4 or A-6 soils) or shaly loam (A-2 or A-4 soils). The subsoils range from silt loam (A-4 or A-6 soils) to shaly silt loam (A-1, A-2, A-4 or A-6 soils) with fragipan (A-4 or A-6 soils). The underlying material is sandy clay loam (A-6 soils), loam (A-2 soils), silty laom (A-2 or A-4 soils) or siltstone, sandstone, and shale.

Highway cuts along I64 (12) from boring site No. 31 to 35 show sandstone shale rock exposure. At site No. 33 the profiles shows 1.0 ft (30 cm) of topsoil followed by 1.5 ft (46 cm) of silty clay loam (A-6 (8) soils) which is composed of 20% sand,

55% silt and 25% clay. Further down in the profile a sandy loam (A-2-6) soil is encountered before the weathered shale is reached along SR 491 (13) from boring site No. 16 to 19, bedrock is encountered from 3.5 ft to 8 ft (107-243 cm.). At site No. 16 the first 2 ft (61 cm) is silty loam (A-4) soil. The next 4.5 ft (1.4 m) is classified as silty clay loam (A-6 (9)). It is composed of 10% sand, 72% silt and 18% clay. The brown hard weathered sandstone is reached below the silty clay loam.

The engineering problems associated with this region are associated with the cuts and fills. Different types and characteristics of residual soils or bedrock are encountered within short distances both horizontally and vertically.

Miscellaneous

Quarries

There are very few quarries in Dubois County. One is located southwest of Huntingburg, section 9, T3S, R5W, as reported by the soil survey of Dubois County (7).

Strip Mining

A very small strip mine area extending, from Pike County was found on the southwest county boundary in the 1937 airphotos.

Organic Deposits

There are no mappable organic deposits identified by the airphoto interpretation method in this county.

BIBLIOGRAPHY

1. Frost, R. E., et.al., "Manual on the Airphoto Interpretation of Soils and Rocks for Engineering Purposes", Joint Highway Research Project, Purdue University, Lafayette, Indiana, March 1953.

2. Belcher, D. J., Gregg, L. E. and Woods, K. B., "The Formation, Distribution and Engineering Charateristics of Soils," Bulletin No. 87, Engineering Experiment Station, Purdue University, Lafayette, Indiana, 1943.

3. Yeh, P. T., "Drainage Map of Dubois County," Joint Highway Research Project, Purdue University, West Lafayette, Indiana, 1953.

4. "Handbook of Indiana Geology," Indiana Department of Conservation, Indianapolis, Indiana, 1922.

5. Leverett, F., "The Illinois Glacial Lobe," United States Geological Survey Monograph XXXVIII, Washington, D. C., 1899.

6. Perry, J. I., et.al., "Indiana's Water Resources," Bulletin No. 1, Indiana Flood Control and Water Resources Commission, Indianapolis, Indiana, June, 1951.

7. Wingard, R. C., Jr., "Soil Survey of Dubois County, Indiana," Soil Conservation Service, United States Department of Agriculture Soil Conservation Service and Forest Service in cooperation with Purdue University Agriculture Experiment Station, February 1980.

8. Simmons, C. S., et.al., "Soil Survey of Dubois County, Indiana," United States Department of Agriculture in cooperation with the Purdue University Agricultural Experience Station, Government Printing Office, Washington, D. C., 1930.

9. Logan, W. H., "The Sub-Surface Strata of Indiana," Publication No. 108, Indiana Department of Conservation, Ft. Wayne Printing Co., Ft. Wayne, Indiana, 1931.

10. Henry, H. G., et.al., Geologic Map of the Vincennes Quadrangle, Indiana Department of Natural Resources, Indianapolis, Indiana 1970.

11. Moultrop, K., "Airphoto Boundary Delineation of Loess and Loess-Like Soil in Southwestern India," An MSCE Thesis, Purdue University, Lafayette, Indiana, January 1953.

12. "Soil Profile Survey I-Project 64-2 (4) 57 P.E., I-64-2 (19) 57 Grading, J-64-2 (20) 57 paving. Dubois County, Indiana" prepared for Engineer Associates, INC. Evansville, Indiana, by H. W. Lochner, Inc. Chicago, Illinois, November 1961.

13. "Soil Profile Survey S-project No. 108 (4) P.E., Dubois and Crawford Counties, Indiana" The H. C. Nutting Company, Cincinnati, Ohio, October 1974.

14. "Soil Profile Survey S-project No. 491 (7) P.E., (11) R/W, (12) Constr., Dubois County, Indiana" Floyd E. Burroughs Associates, Indianapolis, Indiana, November 1961.

15. Simmons, V. M., Esarey, R., "Dubois County, Indiana," Supplement to publication 108, "Sub-Surface Strata of Indiana", Division of Geology, Department of Conservation, State of Indiana, February 1938.

16. Fehrenbacher, J. B., "Loess Distribution and Composition in Portions of the Lower Wabash and Ohio River Basins," a Ph.D. Thesis, Purdue University, Lafayette, Indiana, June 1964.

Appendix A. Loess Thickness Measurements of Dubois County (Fehrenbacher, 1964)

No.	Township	Range	Section	Thickness (in)	Underlying Material
1	1N	3W	26, NE160, NW40	35	SS Residuum
2	1N	3W	29, SW40	48	SS & Sh Residuum
3	1N	4W	13, SE160, SW40	50	SS Residuum
4	1N	4W	30, SW40	50	SS & Sh Residuum
5	1N	5W	26, SW40, NW40	60	Drift Soil
6	1N	5W	30, NE160, SW40	70	Sandy Loam
7	1S	3W	14, SW160, NW40	45	SS Residuum
8	1S	5W	17, SW160, SE40	45	Silty Loam and Sandy Clay Loam
9	2S	3W	11, SW160, NW40	40	SS Residuum
10	2S	4W	4, NE160, SW40	35	SS Residuum
11	2S	4W	18, NE40	40	SS Residuum
12	3S	3W	1, SE40	40	SS Residuum
13	3S	4W	4, SW40, NW10	36	SS Residuum
14	3S	5W	9, NE160, SE40	46	SS Residuum
15	3S	6W	12, NW160, SW10	45	SS Residuum

SS: Sandstone

Sh: Shale

APPENDIX B

SOIL TEST DATA

The soil test data tabulated below was obtained from consultant's reports prepared for the Indiana State Highway Commission. The location of the site is shown on the attached engineering soils map.

Site	Station	Offset (ft.)	Depth (ft.)	Texture	AASHTO Classification	Gravel	Percent Sand	Silt	Clay	L.L.	P.L.	P.I.	S.L.
1	194+00	15 Rt	6.5- 8.0	A-5(2)	Sandy Cl. L. & org. matr.	0	65	14	21	44	38	6	41
2a	198+00	5 Rt	1.0- 6.0	A-6(9)	Silty Cl. L.	0	15	58	27	28	16	12	17
2b	198+00	5 Rt	2.0- 4.0	A-6(9)	Silty Cl. L.	0	15	58	27	28	16	12	17
2c	198+00	5 Rt	6.0- 8.0	A-6(8)	Clay Loam	0	42	31	27	31	16	15	16
2d	198+00	5 Rt	10-12	A-4(7)	Clay Loam	0	39	40	21	23	19	4	17
2e	198+00	5 Rt	12-14	A-4(7)	Clay Loam	0	40	37	23	22	17	5	14
3	221+00	18 Lt	1.5- 3.0	A-7-6(10)	Clay	0	17	49	34	41	25	16	21
4	242+00	CL	7.5- 9.0	A-2-4(0)	Sandy Loam	0	71	19	10	NP	NP	NP	NP
5	46+75	10 Rt	5.0- 6.0	A-4(8)	Silty Loam	0	33	53	14	28	20	8	22
6	72+00	12 Lt	5.0- 6.5	A-7-6(15)	Clay	0	19	37	44	45	20	25	18
7	85+49	CL	2.5- 4.0	A-6(9)	Silty L. with tr. of org. mat.	0	16	66	18	33	21	12	22
8a	107+70	CL	0.5- 1.5	A-4(8)	Silty Loam	0	13	69	18	30	20	10	21
8b	107+70	CL	7.0- 8.0	A-4(4)	Sandy Loam	0	50	44	6	NP	NP	NP	18
9	126+00	CL	2.5- 4.0	A-6(9)	Silty Cl. L.	0	17	57	26	38	25	13	23
10	130+50	CL	1.0- 3.0	A-4(8)	Silty Loam	0	20	63	17	30	20	10	22
11a	181+25	CL	0.5- 1.5	A-4(8)	Silty Loam	0	21	66	13	29	19	10	20
11b	181+25	CL	5.0- 6.0	A-6(13)	Clay	0	31	35	34	39	17	22	19
12a	201+00	15 Lt	1.0- 2.5	A-4(3)	Sandy Loam	0	50	34	16	25	18	7	21
12b	201+00	15 Lt	5.0- 6.0	A-6(9)	Silty Cl. with tr. of org. mat.	0	10	72	18	35	22	13	21
13	238+00	12 Lt	1.0- 2.0	A-6(11)	Clay	0	21	38	41	40	22	18	19
14	245+00	12 Lt	1.0- 2.0	A-4(1)	Sandy Loam	0	62	26	12	22	16	6	20
15	252+00	12 Rt	5.0- 6.0	A-4(8)	Silty Cl. L.	0	25	55	20	26	17	9	19
16	282+50	12 Lt	1.0- 7.0	A-6(9)	Silty Loam	0	10	72	18	35	22	13	21

Site	Station	Offset (ft.)	Depth (ft.)	Texture	AASHTO Classification	Percent Gravel	Sand	Silt	Clay	L.L.	P.L.	P.I.	S.L.
17a	300+00	CL	5.0- 6.0	A-6(4)	Sandy Cl. L.	0	53	26	21	27	15	12	18
17b	300+00	CL	8.0- 9.0	A-6(7)	Clay Loam	0	40	37	23	29	16	13	18
18	310+50	16 Lt	1.0- 2.0	A-7-6(13)	Silty Clay	0	6	62	32	43	21	22	17
19	320+00	15 Rt	1.0- 4.0	A-6(11)	Silty Clay	0	6	63	31	34	22	17	20
20	588+00	CL	5.0- 7.0	A-2-6(0)	Sandy Gravel with clay seam	64	18	9	9	35	18	17	16
21a	601+00	30 Rt	0.5- 2.0	A-4(3)	Clay Loam	16	19	43	22	27	19	8	17
21b	601+00	30 Rt	2.0- 12	A-7-6(22)	Clay	9	15	33	43	46	16	31	--
22a	606+50	60 Lt	5.0- 7.0	A-4(0)	Sandy Loam	0	50	38	12	19	15	4	--
22b	606+50	60 Lt	7.0- 8.5	A-2-4(0)	Sandy Loam	0	73	20	7	NP	NP	NP	--
22c	606+50	60 Lt	12.0-13.5	A-2-4(0)	Sandy Loam	0	79	16	5	NP	NP	NP	--
23	608+00	60 Rt	18.5-20.5	A-4(9)	Silty Cl. L.	0	9	63	28	31	20	10	23
24a	615+00	CL	5.0- 7.0	A-6(13)	Silty Clay	0	10	57	33	33	18	15	23
24b	615+00	CL	12.0-13.5	A-4(8)	Silty Cl. L.	0	7	64	29	30	22	8	18
25	624+00	30 Rt	1.0- 8.0	A-2-4(0)	Sandy Loam and Gravel	43	26	18	13	22	17	5	18
26	1268+30	42 Rt	13.0-15.0	A-6(10)	Clay	0	20	39	41	32	17	15	18
27	1274+00	42 Lt	12.5-14.0	A-2-6(0)	Sandy Loam	0	76	11	13	38	27	11	24
28	1277+00	42 Rt	12.0-14.0	A-7-6(17)	Silty Cl. L.	0	17	56	27	48	20	28	20
29	1286+00	70 Rt	2.0- 4.0	A-4(8)	Silty Cl. L.	0	15	58	27	32	22	10	23
30	1290+00	70 Rt	12.0-13.5	A-6(10)	Clay	0	16	43	41	35	21	14	19
31	1317+00	70 Lt	0.5- 5.0	A-6(9)	Silty Cl. L.	0	17	53	30	35	23	12	23
32	1312+50	10 Lt	1.0- 2.0	A-6(8)	Silty Cl. L.	0	20	55	25	32	21	11	20
33	1328+00	70 Rt	10.5-11.0	A-7-6(14)	Clay	0	21	24	55	46	23	23	22
34	1314+00	CL	0.5- 4.5	A-6(8)	Silty Clay	0	6	57	37	37	26	11	22
35	1350+00	70 Rt	0.5- 2.0	A-7-6(11)	Silty Clay	0	6	52	42	41	25	16	23

Cl. means Clay, L. means Loam

APPENDIX C

Well-Logs of Dubois County (Simmons, V. M. 1938)

Ferdinand Township

AUFFART, Cecilia #1, 225' from N line, 225' from E line, NE¼ SW¼ sec. 25, T3S, R5W. Completed Dec. 26, 1934, by the Ohio Oil Co. DRY HOLE. Plugged 1-3-35.

Surface	12	Broken sand	490	Sand, hard	734
Sand rock	18	Lime	498	Lime, hard	741
Shale	50	Shale	501	Shale;red rock	748
Shale;lime shells	58	Sand (water)	552	Sand	763
Shale,muddy	102	Shale	560	Shale	765
COAL	104	Lime	593	Sand	772
Sandy shale	205	Sand	598	Shale	776
Sand;little water	225	Sandy shale	612	Red rock;shale	790
Broken sand	240	Red rock	616	Lime, hard	795
Shale	280	Red rock;shale	625	Shale; red rock	805
Lime shells	284	Muddy shale	637	Sandy shale	823
Shale	355	Lime	653	Lime	845
Sandy lime	375	Shale	656	Shale	847
Sandy shale	395	Lime	666	Lime	870
Shale	398	Shale	685	Shale,green	872
Sandy shale	433	Sand;hole full water at 693'	712	Lime	920
Lime shells	437	Sandy shale	726	Broken lime; and green shale	930
Shale	480			Hard lime	943

CASING RECORD

10" — 150' 8¼" — 398' 6 5/8" — 738'

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Jefferson Township

BOOKMAN, Hugh #2, 500' from S line, 500' from E line, SW¼ SW¼, sec. 15, T3S, R3W. Completed April 12, 1937, by A. B. Bement. DRY HOLE. Plugged 4-14-37.

Blue lime	125	Shale	350	Sulphur water	759
Lime shells	175	Shale	370	Dark lime	886
Water	185	Sandy shale	380	Shale & lime	903
Water	195	Big lime	402	Lime,dark	942
Lime	225	Muddy slate	424	Shale	997
Sandy shale; show GAS	235	Jackson sand	436	Gray lime	1004
Red rock	245	Lime shells	462	Coarse lime	1023
Shale breaks	250	Red rock; shale	470	Brown lime	1048
Red rock	260	Sandy lime	478	show OIL 1058'	
Shale rock	275	Sandy lime	502	Light sand	1068
Hard lime	304	Lime	509	Dark lime;changing light about every 5 feet.	1198
Shale	315	Show oil	518		
Big water	320	Sandy lime	618		
Sandy shale	325	Lime, hard	729		
		Lime,light	759		

CASING RECORD

6¼" — 770'

Harbison Township

ECK, John #1, 200' from N line, 200' from W line, NW¼ NW¼, sec. 5, T1N, R4W. Completed Sept. 14, 1934, by F. L. Damron, et al.

Soil	4	Sand, water	295	Slate	488
Sandstone	30	Slate	298	Red rock	500
Blue mud	40	Sand, hard	328	Slate	520
Blue slate	43	Slate	329	Blue sand, broken	540
COAL	45	Brown lime	349	Slate	546
Slate, mud	65	Slate	356	Lime, brown; little GAS 550-555'	564
COAL	67	Jett sand	362	Slate	575
Slate	70	Blue sand, broken	370	Bethel sand; little water	583
Sand	82	Slate	387	Slate	587
Blue mud	105	Little lime	409	Blue sand, broken	593
White slate	115	Slate	422	Slate	598
Black slate	120	Broken sand	428	Brown lime	613
Broken	150	Red rock	432	Slate, white	618
Slate	190	Sand, hard Water at 440' GAS 455-460'	438	Lime, white	628
Broken sand	205	White sand	474	Slate, white	631
Slate	230	Lime, brown	484	Brown lime; GAS-635	636
Broken sand	240				
Slate, muddy	272				

CASING RECORD

10" — 9'　　8¼" -- 333'　　6 5/8" -- 477'

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Harbison Township

ECK, John #2, 200' from S line, 200' from E line, SW¼ SW¼, sec. 32, T1S, R4W. Completed October 26, 1935, by W.W. Damron. DRY HOLE. Plugged 10-28-35.

Soil	4	Sandy slate	265	Coarse sand, hard	473
Sand	18	Sand	272	Lime, Barlow; SLM at 474'	483
Blue mud	25	Broken sand; slate	290	Slate; red rock	506
Sand; little COAL	50	Broken sand	295	Sand, broken	510
Blue mud; fire clay	68	Water sand; more water	324	Slate	512
COAL; little water	70	Slate	327	Red rock	520
Slate	72	Brown lime; SLM at 340'	342	Sand	528
Sand	82	Lime, hard	348	Muddy slate	538
COAL	85	Slate	360	Broken sand	545
Blue mud	95	Sandy slate	362	Muddy slate	554
Slate; sand shells; water	112	Sandy lime	370	Lime shell	555
Black mud; shale or slate	120	Red rock	372	Blue slate	559
Sand	130	Slate, soft, muddy	393	Lime, hard	570
Sand; little water	155	Lime, gray	394	Blue slate	577
Sandy slate	170	Lime	408	Sand	590
Blue slate	180	Slate	411	Slate	601
Slate	205	Lime	413	Slate	602
Sand; little water	210	Slate	428	Lime, brown	617
Slate	215	Red rock	435	White slate	619
Slate; broken sand	260	Sand; water	462	Break	623
				White lime	633

Slate break	637	Little water 650'		more water	667
Brown lime, hard	645	Brown rotten lime	665	Total depth	667
White sandy lime	657	White sandy lime;			

CASING RECORD

10" -- 19' 6 5/8" -- 344' 5 3/16" -- 601'

********* ********

Harbison Township

FRITCH, Albert #1, 200' from N line, 200' from E line, SE¼ NW¼, sec. 32, T1N, R4W. Completed August 4, 1934, by F. L. Damron, et al. DRY HOLE. Plugged 8-7-34.

Soil	12	Slate	270	some GAS	513
Sandstone	15	Sand	292	Slate	515
Mud	19	Slate	362	Lime	525
COAL	20	Brown lime	374	Slate	528
Mud	25	Slate	377	Sand, Barlow;	
White mud	50	Jett sand	396	water	538
Sand	60	Red rock	399	Slate	580
Blue mud	67	Slate	405	Broken sand, blue	600
Sand, hard	71	Red rock	409	Lime	612
Slate	76	Slate	432	Slate	615
Sand	83	Little lime	440	Sand; water	625
Slate	90	Break	442	Blue broken sand	644
Sand	105	Little lime	449	Lime, brown	659
Slate	125	Slate	451	Slate	665
COAL; water	127	Lime	453	Lime, white	675
Slate	132	Slate	463	Slate, white	678
Sand	148	Red rock	468	Lime, brown	704
Slate	185	Slate	473	Break, blue lick w.	711
Sand	210	White sand; water &		Lime, hard	744

CASING RECORD

10" -- 12' 6 5/8" -- 612'

******** ********

Harbison Township

Hautsch, Geo. F. #1, 200' from N line, 200' from W line, NW¼ NE¼ SE¼ sec. 6, T1S, R4W. Completed Oct. 11, 1934, by F. L. Damron, et al. DRY HOLE. Plugged 10-12-34.

Soil	7	Sand, white; water	325	Sand; hole full w.	514
Sandstone	63	Sand, hard	363	Lime, brown	524
Blue mud	76	Lime	365	Slate; red rock	535
Broken sand	115	Sandy lime	372	Blue sand	542
Slate, muddy	135	Lime	394	Slate	558
Broken sand	170	Slate	405	Broken sand	563
Sand	185	Red rock	415	Slate	569
Blue slate, muddy	205	Slate, muddy	432	Lime	573
Slate	237	Little lime; sandy	448	Slate	598
Broken sand	258	Slate, muddy	462	Lime	611
Slate	268	Red rock	477	Slate	615

Shale	620	Brown lime	654	Brown lime	683
Blue sand, broken; little water	640	Slate	660	White sand; full of water	690
		Lime, white	670		

CASING RECORD

$8\frac{1}{4}$" -- 365' 6 5/8" -- 515'

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Madison Township

HOPF, Anton #1, 1400' from S line, 1200' from E line, NE$\frac{1}{4}$ SE$\frac{1}{4}$, sec. 7, T1S, R5W. Drilled in January, 1932, by the Jasper Oil & Gas Company. Elevation 450'. DRY HOLE. Plugged 3-12-32.

Surface	3	Shale, dark	340	Lime	688
Muck water	50	Lime, broken	350	Red rock	705
COAL	52	Sand	360	Shale, dark	740
Shale	57	Slate	363	Lime	750
Lime	62	Lime	390	Shale, dark	760
Sand, broken	75	Shale	435	Lime	782
Sand, light; water	85	Sand	505	Shale	812
Shale	88	Shale	520	Lime, brown	858
Lime	94	Lime, gray, little	540	Lime, gray, hard; show OIL 863'	862
Sand	103	Shale, dark	562	Lime, gray, soft	873
COAL	104	Lime, sandy	576	Lime, gray; water	910
Shale	122	Red rock	580	Lime, gray	915
Sand	137	Shale	590	Lime, light	1000
Shale, light	147	Lime, gray, Big	623	Lime, brown	1060
Sand, light	225	Shale, light	633	Lime, light	1100
Shale	260	Red rock	638		
Sand, light; 3 blrs. water	306	Shale	660		
Lime	309	Sand, top Oakland City	676		

CASING RECORD

$12\frac{1}{2}$" -- $59\frac{1}{2}$' 10" -- (?) $8\frac{1}{4}$" -- 252' 6 5/8" -- 520'

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Harbison Township

HUFFMAN, Henry #1, 500' from S line, 660' from W line, SE$\frac{1}{4}$ SW$\frac{1}{4}$, sec. 31, T1N, R4W. Completed November, 1934, by W. W. Damron. DRY HOLE. Plugged 11-8-34.

Soil	5	Blue slate, muddy	274	Slate	451
Sandstone	40	Sand	312	Jackson sand	465
Blue mud	47	Water sand	330	White sand	475
COAL; water	49	Slate	332	Hard sand	480
Sand	62	Blue sand	340	Broken sand	490
Blue mud	75	Slate	351	Slate	492
Slate	90	Lime	378	Lime	506
Sand	105	Slate	380	Slate, red rock	513
Slate	138	Blue broken sand	400	Sand	520
Broken sand	170	Red rock, slate	410	Slate	551
White sand; water	187	Lime	432	Lime	556

Slate	586	Slate	632	Brown lime	677
Hard lime	602	White lime	655	Blue lick break	685
Slate	612	Brown lime	660	Lime	691
Lime	628	Break in lime	668		

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Marion Township

HUMBERT, Anthony & Elizabeth #1, 300' from N line, 300' from W line, SW¼ SW¼, sec. 25, T1S, R4W. Completed by F. L. Damron, et al, January 10, 1935.

Soil	5	Sand, white (Water 285')	327	Slate	545
Sandstone	55			Lime	550
Slate	71	Slate	330	Slate	571
COAL	72	Brown lime	362	Brown lime	599
Slate	110	Slate	394	Slate	602
Sand	120	Lime	423	Lime, white	620
Broken sand	145	Slate, red rock	433	Slate	621
Broken samd	165	Sand, Jackson (Water 438')	480	Brown lime	647
Sand	192			Break in lime	651
Slate	210	Lime, Barlow	492	Lime	665
Sand	215	Slate, red rock	497	Break; show from 670-675	675
Slate, muddy	220	Sand; water 505'	518		
Sand	238	Slate, muddy	535	Lime	682½
Slate	240	Sand	540		

CASING RECORD

6 5/8" — — 482

******** ********

Marion Township

HUMBERT, Anthony #2, 50' from S line, 300' from E line, SW¼ SW¼, sec. 25, T1S, R4W. Completed Feb. 23, 1935, by W. W. Damron, et al. DRY HOLE. Plugged 2-30-35.

Soil	10	Water sand	342	Slate	615
Sandstone	64	Lime	377	Lime, white	630
Slate	66	Slate & red rock	405	Break	632
White sand; some water	76	Lime	436	Lime	661
		Slate & red rock	447	Break	665
Slate	118	Sand	492	Lime, brown	682
Broken sand	137	Lime	504	Break in lime; OIL show 687'	692
Slate	144	Red rock; slate	510		
Hard sand shell	148	Sand, Barlow	530	Lime	704
Broken sand	211	Slate	543	Break	707
Slate	248	Sand	551	Lime	716
Sand	257	Slate	565	Break; water 715-721	721
Slate	261	Lime	569		
Sand, broken (Water 300')	295	Slate	587	Lime, brown	736
		Mississippi lime	612	Broken sandy shale	750

CASING RECORD

8¼" — 344'　　　6 5/8" — 532'

******** ********

Cass Township

HEMMER, Eli B. No. 1, 330' from S line, 330' from W line, SE¼ NW¼, section 18, T3S, R5W. Completed Mar. 20, 1939, by Fred Phillips. Elevation 518'. DRY HOLE. Plugged 4-13-39.

Yellow clay	20
Gray shale	45
Blue shale	55
Dark shale	83
Gray sandy shale	95
Sandy shale	105
Gray sand	112
Broken sand	116
Gray shale	130
Broken sand	155
Dark shale	190
Gray shale	195
Broken sand; water at 197'	203
Gray sand; more water at 210'	210
Water sand	233
Dark shale	235
Sand; S.L.M. 268'	277
Shale	280
Blue shale; bailing water	286
Sand; little water at 290'-300'	300
Shale & sand shells	308
Gray sand; hole full water at 318'	318
Water sand	340
Broken sand	345
Blue shale	355
Hard gray sand	360
Dark shale	378
Black slate	380
Gray sandy shale	415
Broken sand	431
Gray sandy shale	456
Dark shale	460
Dark sandy shale	470
Dark shale	477
Gray broken sand	495
Gray shale	504
Lime shells	515
Gray shale	520
Lime shells, hard	531
Gray shale	536
Gray sandy shale	547
Lime	550
Gray sandy shale	560
Light shale	565
Hard sand	568
Shale	585
Dark shale	600
Gray sandy shale	620
Hard gray sand	625
Light sandy shale	640
Dark sandy shale	655
Sand	665
Gray shale	685
Hard gray lime	695
Hard brown lime	708
Blue shale	714
COAL	716
Blue shale	729
Broken sand	736
Red rock	745
Gray shale	760
Hard lime shells	763
Gray shale	765
Hard brown lime	770
Gray shale	772
Hard gray lime	800
Gray shale	804
Red rock	808
Gray shale	835
Blue sand	845
Hard lime	852
Gray shale	857
Blue sand	861
Red rock	875
Sand	884
Shale	887
Blue sand	892
Shale	897
Hard lime	899
Blue shale	915
Sand	925
Gray sandy shale; S.L.M. 939'	939
Hard lime	952
Shale	960
Sand	970
Dark shale	978
Sand	985
Lime	1000
White shale	1007
Hard lime; hole caving at 1011'-1019'	1028
Brown sandy lime; S.L.M.	1037
Lime	1041
Gray sandy lime; water	1050

CASING RECORD

13" -- 175' 10" -- 346' 8" -- 945' 6 5/8" -- 1033'

Shale	795	Lime, sandy	902	Shale	990
Lime, white	811	Shale	910	Lime	1017
Shale	818	Red rock	913	Shale	1021
Red rock	822	Shale	925	Lime, sandy	1023
Shale, light	860	Lime	930	Lime	1070
Lime	872	Sand	948		
Shale	890	Lime	962		

CASING RECORD

10" 177'

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Madison Township

MUTCHMAN, John, #1, SE corner of SW$\frac{1}{4}$ SW$\frac{1}{4}$. sec. 36, T1S, R6W. Completed Aug. 14, 1930, by Mecca Oil Co. DRY HOLE. Plugged Aug. 14-30.

Soil	6	Lime, light	432	Slate	610
Quicksand	86	Slate, blue	440	Lime, gray	612
Lime, hard	94	Red rock	450	Slate, green	618
Slate	105	Slate	470	Red rock	619
Lime, light	115	Lime, light	495	Slate, light	658
Slate, blue	140	Slate	500	Lime, brown	669
Sand, light, water	185	Lime, light	505	Slate, light	692
Slate, blue	225	Slate, "	535	Lime, brown	705
Lime, light	255	Sand, "	550	Slate, green	710
Slate, white	335	Slate, "	555	Lime	755
Sand, light	370	" gray	560	Sand, brown	760
Slate, blue	380	Lime, brown	565	Sand, white, water	782
Slate, sandy	400	Slate, blue	570	Lime, gray	802
Mud, blue	410	Sand, white	595		

CASING RECORD

10" -150' 8$\frac{1}{4}$" - 658'

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Patoka Township

MUTCHMAN, Walter, #1, 150' from N. line, 200' from E. line, SE$\frac{1}{4}$ NW$\frac{1}{4}$. sec. 36, T2S, R5W. Completed Sept. 9, 1937, by A.D.Shaffer. Elev.468'. DRY HOLE.

Soil	15	Lime	362	Hole full w.	135-165
Sand	25	Sand	413	Show of GAS	372-390
Lime	30	Shale	417	Water	498-500
Shale	66	Lime	451	Sulphur W.	760-765
COAL	68	Shale	486	" Water	830-835
Shale	151	Lime	498	" "	890-915
COAL	157	Sand	500	Small show	
Shale	230	Shale & lime		of OIL	1065 -1985
Lime	250	shells	700		
Shale	319	Lime Total D.	1202		
Sand	323				

CASING RECORD

8$\frac{1}{4}$" -- 488' 6$\frac{1}{4}$" -- 1056'

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Harbison Township

NEUKAN, David, Jr., #1, 1053' from N. line, 990' from E. line, NE$\frac{1}{4}$ SE$\frac{1}{4}$. sec. 25, T1N, R4W. Completed July 5, 1932, by the Ohio Oil Company. Elevation 491'. DRY HOLE. Plugged 7-8-32.

Top soil	30	Shale, gray	245	Shale, gray, sandy	1386
White sand	80	Red rock	253	Sand, copper color	1405
Lime, white	110	Shale, blue	270	Shale, sandy	1412
Shale, gray	120	Sand, white; small show GAS	285	Lime, blue	1416
Red rock	130	Lime, white	293	Shale, gray	1490
Shale, gray	145	Slate, gray	320	Lime, gray	1493
Lime, white	148	Lime, brown	330	Cinnamon shale	1619
Shale, blue	150	Shale, gray	339	Corniferous brown lime; water 1644 to 1649'	1730
Lime, blue	165	Sand, gray; show of GAS	356		
Shale, blue	170	Lime, show OIL at 847-870-930'	1321		
Red rock	175				
Sand, white; water	225				
Lime, brown	240				

CASING RECORD

12$\frac{1}{2}$" -- 29'; 10" -- 266'; 8$\frac{1}{4}$" -- 1386'.

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Harbison Township

NEUKAN, David Jr., #1, 400' from N. line, 300' from E. line, NW$\frac{1}{4}$ SE$\frac{1}{4}$. sec. 25, T1N, R4W. Completed Aug. 21, 1935, by Claude E. Noble. Initial production 1,000,000 cu. ft. GAS.

Clay, yellow	12	Slate	150	GAS	277
Sand, gray, water	25	Lime, gray, little	163	Sand, gray, hard	294
" "	55	Slate	183	Shale	320
Slate, light	60	Sand, gray	229	Lime, brown	331
Sand, "	110	Lime, "	244	Slate	345
Lime, gray	116	Sand, gray, hard	250	Sand, gray, dry	353
Sand, "	125	Red rock	254	Slate	354
Red rock	127	Slate	270	Sand, gray: GAS	359
Sand	132	Sand, gray, soft;			

CASING RECORD

8" --- 33'

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Marion Township

SCHROERING, Joe, #1, 300' from S. line, 650' from E. line, SE$\frac{1}{4}$ SE$\frac{1}{4}$. sec. 26, T5N, R4W. Completed June 12, 1935, by F. L. Damron et al. Plugged 6-25-35.

Soil	10	COAL	82	Sand, broken	175
Sandstone	65	Slate	120	Sand	204
Slate	81	Sand	130	slate	222

Sand	225
Slate, muddy	230
Sand	245
Sand, broken, slate	260
Sand; water at 265'	278
Break	280
Sand	337
Slate	340
Lime, brown	372
Slate	404
Lime	433
Sand; Jackson: water	466
Sand, broken	474
Barlow lime	484
Slate, green, red rock	490
Barlow sand; water	512
Slate, sandy; red rock	520
Sand, bluish; little GAS	528
Slate	534
Lime, brown, hard	544
Break	546
Lime	550
Slate	560
Slate, soft & muddy	568
Lime	582
Slate	584
Break	586
Lime, brown	610
Slate	614
Lime, white	630
Slate	631
Lime, brown	660
Break	662
Lime	675
Break	681
Lime	691

CASING RECORD
6 5/8" -- 475'
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Harbison Township

SENDEWICK, F. #1, 200' from S. line, 200' from W. line, SW¼ NW¼, sec. 33, T1N, R4W. Completed Aug. 28, 1934, by F. L. Damron et al. DRY HOLE. Plugged 8-28-34.

Soil	10
Mud, sandy	20
Mud, blue	33
COAL, water	35
Mud, blue	57
Sand	73
Slate	78
Sand	83
Slate, muddy	105
Slate	135
Sand	143
Slate, gray	170
Slate, black	194
Sand, water	225
Lime, gray	239
Slate	247
sand	259
Slate	274
Red rock	284
Slate	295
Lime	310
Slate	313
Lime	317
Slate	325
Red rock	335
Sand; little GAS	337
Sand; Jackson; Hole full water	360
Sand	380
Lime, Barlow	389
Barlow sand	391
Slate	395
Red rock	405
Barlow Sand, Little GAS	410
Slate	438
Lime	443
Slate	455
Lime, hard	474
Slate	487
Sand; Hole full water	492
Sand, Bethel	510
Lime, white	525
Slate	530
Lime, white	547
Lime, brown	567
Break in lime; water	570
Sand; Blue Lick water	575

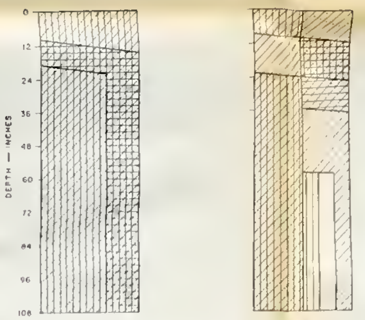
CASING RECORD
$8\frac{1}{4}$" -- 107' $8\frac{1}{4}$" --- 384' 6 5/8" -- 555'
******** ********

JHRP 83/7

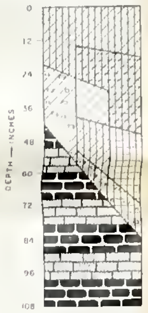
GENERAL SOIL PROFILES
ALLUVIAL PLAIN
ALLUVIAL TERRACE
LACUSTRINE PLAIN
LACUSTRINE TERRACE
DEEP LOESS COVERED TILL
SAND DUNE
DISCONTINUOUS LOESS COVERED BEDROCK
DEPTH — INCHES
DAVIESS CO.
MARTIN CO.
PIKE CO.
ORANGE CO.
CRAWFORD CO.
PERRY CO.
PORTERSVILLE
THALES
HILLHAM
CRYSTAL
NORTON
KELLERVILLE
HAYSVILLE
CUZCO
DUBOIS
ELLSWORTH
IRELAND
JASPER
CELESTINE
MILLERSPORT
MALTERSVILLE
SCHNELLVILLE
DUFF
ST ANTHONY
MENTOR
BIRDS-EYE
ST MARKS
KYANA
BRETZVILLE
HUNTINGBURG
HOLLAND
FERDINAND
JOHNSBURG
ST. HENRY
LEGEND
PARENT MATERIALS
(GROUPED ACCORDING TO LAND FORM AND ORIGIN)
DEEP LOESS COVERED TILL
DISCONTINUOUS LOESS COVERED SANDSTONE – SHALE
TERRACE, VALLEY TRAIN
LACUSTRINE PLAIN
ALLUVIAL PLAIN
SAND DUNE
MISCELLANEOUS
BORING SITE
LAKE OR POND
STRIP MINE
QUARRY
TEXTURAL SYMBOLS
(SUPERIMPOSED ON PARENT MATERIAL TO SHOW RELATIVE COMPOSITION)
GRAVEL
SAND
SILT
CLAY

DEEP LOESS COVERED TILL

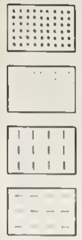
SAND DUNE



DISCONTINUOUS LOESS COVERED BEDROCK



TEXTURAL SYMBOLS
(SUPERIMPOSED ON PARENT MATERIAL TO SHOW RELATIVE COMPOSITION)



TEXTURAL SYMBOLS FOR SOIL PROFILES

ENGINEERING SOILS MAP
DUBOIS COUNTY
INDIANA

PREPARED FROM
1940 AAA AERIAL PHOTOGRAPHS
BY
JOINT HIGHWAY RESEARCH PROJECT
AT
PURDUE UNIVERSITY

1983

SCALE OF MILES

PREPARED UNDER THE SUPERVISION OF C. T. HUANG AND R. D. MILES

DRAWN BY E. P. H. CHEN

COVER DESIGN BY ALDO GIORGINI